



- EXPLANATION**
- Qal** Alluvium (Holocene)—Grades from clay to gravel, consists predominantly of organic-rich silt to fine sand. The alluvium is generally represented by small discontinuous deposits within smaller river and stream beds, but can be quite extensive in the large river valleys and floodplains; also included are deposits of artificial fill and modified land.
 - Qb** Marsh, bog, and peat deposits (Holocene and Pleistocene)
 - Qvrg** Vashon recessional outwash deposits (Pleistocene)—Moderately to poorly sorted gravel and sand with small amounts of silt and clay; include ice-contact deposits, glacial outwash alluvium and small amounts of alluvium fill. Qvrg consists of the coarse deposits and Qvt generally consists of the finer deposits.
 - Qvt** Vashon till (Pleistocene)—Predominantly fine-grained deposits consisting of unsorted and unstratified glacial sediments from clay to boulder in size that vary in composition and composition throughout the Puget Sound Lowland.
 - Qva** Vashon advance outwash deposits (Pleistocene)—Consist of stratified and cross-bedded gravels and coarse sands with lenses of silt and clay; include deposits of Colvos sand in the central lowland and Esperance sand in the northern lowland.
 - Qol** Olympia interglacial deposits (Pleistocene)—Quartzite cobbles to dark red, frequently cemented rubble to cobble size gravel consisting of Olympic Mountain derived basalt, graywacke, slate, and sandstone. The gravel also contains thin lenses of discontinuous silt and clay.
 - Qoad** Pre-Vashon alpine glacial deposits (Pleistocene)—Undifferentiated; may also include some Olympia nonglacial deposits.
 - Qnf** Nonglacial floodplain deposits (Pleistocene)—Consisting of interbedded sand, silt, clay and peat of the Whiskey or Knappe Formations.
 - Quf** Pre-Fraser undifferentiated glacial deposits (Pleistocene)
 - Blk** Bedrock—Tertiary and older volcanic and sedimentary rock, undifferentiated.
 - Hydrogeologic contact

- REFERENCES (SEATTLE)**
- Anderson, H.W., Jr., 1966, Ground-water resources of Island County, Washington. Washington Department of Water Resources Water-Supply Bulletin 25, part II, 317 p.
- Booth, D.B., 1990, Surficial geologic map of the Snohomish and Skagitum River areas, Snohomish and King Counties, Washington. U.S. Geological Survey Miscellaneous Investigations Series Map I-1745, 22 p., 1 plate, scale 1:100,000.
- Carr, J.R., and Associates, 1983, Vashon/Maury Island Water Resources Study. Tacoma, Washington, Carr and Associates, unpublished.
- Carr, J.R., Schmidt, R.G., and Ritz, R.W., 1983, Water resource management planning criteria for Vashon/Maury Island, Washington—A case study. In Nielsen, D.M., and Allen, Linda, eds., Proceedings of the NWWA regional conference on ground-water management, San Diego, 1983. National Water Well Association, p. 317-325.
- Dexter, J.D., 1979, Quaternary geology and stratigraphy of Kitsap County, Washington. Bellingham, Washington, Western Washington University, Master of Science thesis, 175 p., 7 plates, scale 1:24,000.
- Dixon, N.P., Olsen, T.D., and Payne, K.L., 1988, Preliminary evaluation of the ground-water resources of Bainbridge Island, Kitsap County, Washington. U.S. Geological Survey Water Resources Investigations Report 87-4237, 82 p.
- Drost, B.W., 1986, Water resources of Clallam County, Washington, phase 1 report. U.S. Geological Survey Water Resources Investigations Report 85-4227, 263 p.
- Drost, B.W., and Lombard, R.E., 1978, Water in the Skagit River basin, Washington. Washington Department of Ecology Water-Supply Bulletin, 47, 247 p.
- Easterbrook, D.J., 1968, Pleistocene stratigraphy of Island County, Washington. Washington Department of Water Resources Water-Supply Bulletin 25, part I, 34 p., 1 plate.
- Garling, M.E., Molenaar, D., and others, 1965, Water resources and geology of the Kitsap Peninsula and certain adjacent islands, Washington. Division of Water Resources Water-Supply Bulletin 18, 309 p.
- Grinstead, Peder, and Carson, R.J., 1981, Geology and ground-water resources of eastern Jefferson County, Washington. Washington Department of Ecology Water-Supply Bulletin 54, 125 p.
- Jones, M.A., 1985, Occurrence of ground water and potential for seawater intrusion, Island County, Washington. U.S. Geological Survey Water Resources Investigations Report 85-4060, 6 sheets.
- Liesch, B.A., Price, C.E., and Walters, K.L., 1963, Geology and ground-water resources of northwestern King County, Washington. Washington Division of Water Resources Water-Supply Bulletin 20, 241 p.
- Luster, J.E., 1969, Geology and ground-water resources of south-western King County, Washington. Washington Department of Water Resources Water-Supply Bulletin 28, 260 p.
- Newcomb, R.C., 1952, Ground-water resources of Snohomish County, Washington. U.S. Geological Survey Water-Supply Paper 1135, 133 p.
- Richardson, Donald, Brigham, J.W., and Madison, R.J., 1968, Water resources of King County, Washington. U.S. Geological Survey Water-Supply Paper 1852, 74 p.
- Sapik, D.B., Bortleson, G.C., Drost, B.W., Jones, M.A., and Prych, E.A., 1989, Ground-water resources and simulation of flow in aquifers containing freshwater and seawater, Island County, Washington. U.S. Geological Survey Water-Resources Investigations Report 87-4182, 4 sheets.
- Seave, J.E., 1957, Geology and ground-water resources of Kitsap County, Washington. U.S. Geological Survey Water-Supply Paper 1413, 178 p.
- Tabor, R.W., Frizzell, V.A., Jr., Booth, D.B., Whetten, J.T., Waitt, R.B., Jr., and Zartman, R.E., 1982, Geologic map of the Snohomish River quadrangle, Washington. U.S. Geological Survey Open-File Report 82-747, 31 p., 1 sheet, scale 1:100,000.
- Washington Department of Ecology, 1978b, Coastal zone atlas of Washington, v. 11, Jefferson County. Washington Department of Ecology DOE 77-21-11, 10 p.
- , 1978c, Coastal zone atlas of Washington, v. 12, Clallam County. Washington Department of Ecology DOE 77-21-12, 10 p.
- , 1979a, Coastal zone atlas of Washington, v. 4, Island County. Washington Department of Ecology DOE 77-21-4, 9 p.
- , 1979b, Coastal zone atlas of Washington, v. 5, Snohomish County. Washington Department of Ecology DOE 77-21-5, 9 p.
- , 1979c, Coastal zone atlas of Washington, v. 6, King County. Washington Department of Ecology DOE 77-21-6, 9 p.
- , 1979d, Coastal zone atlas of Washington, v. 10, Kitsap County. Washington Department of Ecology DOE 77-21-10, 10 p.
- Yount, J.C., Minard, J.R., Demberoff, G.R., 1993, Geologic map of surficial deposits in the Seattle 30' by 60' quadrangle. Washington. U.S. Geological Survey Open-File Report 93-233, 2 sheets, scale 1:100,000.

SURFICIAL HYDROGEOLOGIC UNITS OF THE PUGET SOUND AQUIFER SYSTEM, WASHINGTON AND BRITISH COLUMBIA, FOR THE SEATTLE QUADRANGLE

By
M.A. Jones
1998